

इंटरनेट

मानक

### Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 4158 (1985): Solid embedded type electric heating elements [ETD 32: Electrical Appliances]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



BLANK PAGE



IS : 4158 • 1985

REAFFIRMED

2006

*Indian Standard*  
SPECIFICATION FOR  
SOLID EMBEDDED TYPE ELECTRIC  
HEATING ELEMENTS  
( *First Revision* )

UDC 621.315.551



© Copyright 1986

INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

**AMENDMENT NO. 4 OCTOBER 1994**  
**TO**  
**IS 4158 : 1985 SPECIFICATION FOR SOLID**  
**EMBEDDED TYPE ELECTRIC HEATING ELEMENTS**  
*( First Revision )*

*( Page 11, clause 101 )* — Insert the following Note at the end:

‘NOTE — The test shall be kept in abeyance till further amendment.’

( ETD 32 )

---

Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 3 JUNE 1992  
TO  
IS 4158 : 1985 SPECIFICATION FOR SOLID  
EMBEDDED TYPE ELECTRIC HEATING ELEMENTS**

**( *First Revision* )**

**Substitute 'IS 302-1(1979) Safety of household and similar electrical appliances : Part 1 General requirements ( *fifth revision* )' for 'IS 302 : 1979 General and safety requirements for household and similar electrical appliances ( *fifth revision* )' wherever it appears in the standard.**

**( ETD 32 )**

---

**Reprography Unit, BIS, New Delhi, India**

AMENDMENT NO. 1    AUGUST 1987

TO

IS:4158-1985    SPECIFICATION FOR SOLID EMBEDDED  
TYPE ELECTRIC HEATING ELEMENTS

(First Revision)

(Page 6, clause 7) - Renumber this clause as 7.1 and add the following after 7.1(c) and renumber the subsequent item accordingly:

'd) Thermal efficiency, and'

(Page 11, clause 102) - Substitute 'Thermal Efficiency' for the existing heading of the clause.

(Page 11, clause 102) - Renumber the existing clause as 102.1 and add the following new clause after 102.1:

'102.2 In case the thermal efficiency marked on the heating element is more than 75 percent, a tolerance of -10 percent shall be allowed on this value subject to the provision that the actual efficiency shall in no case fall below 75 percent.'

(ETDC 43)

---

Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 2 MAY 1989**  
**TO**  
**IS : 4158 - 1935 SPECIFICATION FOR**  
**SOLID EMBEDDED TYPE ELECTRIC**  
**HEATING ELEMENTS**

*( First Revision )*

( *Page 8, clause 18* ) — Substitute the following for the existing clause:

**'18. FAILURE**

This clause of IS : 302-1979 is applicable except as follows:

**18.1** ( Paras 3 and 4 ) — **Replacement** — The heating element is operated in air at 1.15 times the rated input, which is maintained throughout the test. The heating element is operated for 96 operating hours under these conditions.

**18.2 to 18.4** — Not applicable.

**18.5 Replacement** — After the test of **18.1**, the heating element shall withstand the electric strength test of **16.4.**'

( ETDC 43 )

---

Printed at Printwell Printers, Delhi, India



# *Indian Standard*

## SPECIFICATION FOR SOLID EMBEDDED TYPE ELECTRIC HEATING ELEMENTS ( *First Revision* )

Electrical Appliances Sectional Committee, ETDC 43

*Chairman*

**SRI A. N. GHOSH**

*Representing*

Development Commissioner, Small Scale Industries  
( Ministry of Industry ), New Delhi

*Members*

**SRI A. BANDOPADHYA** ( *Alternate to*  
**Sri A. N. Ghosh** )

**SRI G. K. AITHAL**

**BRIG M. L. ANAND**

**ASSISTANT DIRECTOR ( STDS )**

**ELECTRICAL**

**JOINT DIRECTOR ( STDS )**

**ELEC/8 ( *Alternate* )**

**SRI VINOD ARTAVANS**

**SRI V. P. ROY** ( *Alternate* )

**SRI B. S. BURKULE**

**SRI K. S. WELLINGKAR** ( *Alternate* )

**CHIEF ENGINEER**

( **ELECTRICAL I** )

**SURVEYOR OF WORKS ( V )** ( *Alternate* )

**SRI ANIL KESHAV DHUMAK**

**SRI B. K. DOSHI**

**SRI N. P. DOSHI** ( *Alternate* )

**SRI K. L. GARG**

**SRI R. P. SEHGAL** ( *Alternate* )

**SRI G. R. GHOSH**

**SRI S. N. KUNDU** ( *Alternate* )

**SRI HARDIT SINGH**

**SRI JAGDIP SINGH** ( *Alternate* )

**SRI R. IYADURAI**

**SRI N. RAJAGOPALAN** ( *Alternate* )

**Bajaj Electricals Ltd, Bombay**

**Consumer Council of India, New Delhi**

**Railway Board ( Ministry of Railways ), New  
Delhi**

**Escorts Ltd, Faridabad**

**Bombay Electric Supply and Transport Undertaking,  
Bombay**

**Central Public Works Department, New Delhi**

**Consumer Guidance Society of India ( Regd ),  
Bombay**

**Jashwantlal Kantilal, Bombay**

**Directorate General of Supplies & Disposals  
( Inspection Wing ), New Delhi**

**Controllarate of Inspection ( Electronics ) ( Ministry  
of Defence ) ( DGI )**

**Ditz Electricals ( India ) Ltd, Delhi**

**Standard Electric Appliances, Tuticorin**

( *Continued on page 2* )

© Copyright 1986

INDIAN STANDARDS INSTITUTION

This publication is protected under the *Indian Copyright Act* ( XIV of 1957 ) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

( Continued from page 1 )

<i>Members</i>	<i>Representing</i>
SHRI V. K. KAPUR	Director of Industries, Delhi Administration, New Delhi
SHRI O. P. SACHDEVA ( <i>Alternate</i> )	
SHRI G. L. KESWANI	Directorate General of Technical Development, New Delhi
SHRI KULMOHAN SINGH	Director of Industries, Government of Haryana, Chandigarh
SHRI O. P. BEHL ( <i>Alternate</i> )	
SHRI G. D. PATIL	Elpro International Ltd, Pune
SHRI H. L. DHAM ( <i>Alternate</i> )	
SHRI RAJINDER NATH	C. Lal Electricals & Mechanicals, Ambala
SHRI SATISH CHANDER ( <i>Alternate</i> )	
SHRI K. P. SETHI	Racold Appliances Pvt Ltd, Pune
SHRI V. K. MANCHANDA ( <i>Alternate</i> )	
SHRI T. SOMASUNDARAM	Department of Industries and Commerce, Government of Tamil Nadu, Madras
SHRI M. RAJAGOPALAN ( <i>Alternate</i> )	
SHRI R. N. SOMAI	Rallis India Ltd, Bombay
SHRI V. R. DAKSHINAMURTHY ( <i>Alternate</i> )	
SHRI D. SUDHAKAR REDDY	Tamil Nadu Electrical Appliances Manufacturers' Association, Madras
DR R. RAMARATHANAM ( <i>Alternate</i> )	
SHRI J. P. SRIVASTAVA	National Test House, Calcutta
SHRI M. P. WELVAKAR ( <i>Alternate</i> )	
SHRI Y. P. SURI	Electrical Appliance Manufacturers' Association, Delhi
SHRI RAMESH KHANNA ( <i>Alternate</i> )	
SHRI H. K. THADANI	National Physical Laboratory ( CSIR ), New Delhi
SHRI S. K. THAKURAL	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
SHRI P. K. SUKURAR ( <i>Alternate</i> )	
SHRI S. P. SACHDEV, Director ( Elec tech )	Director General, ISI ( <i>Ex-officio Member</i> )

*Secretary*

SHRI H. S. SWAMI  
Joint Director ( Elec tech ), ISI

***Indian Standard***  
**SPECIFICATION FOR**  
**SOLID EMBEDDED TYPE ELECTRIC**  
**HEATING ELEMENTS**  
**( *First Revision* )**

**0. FOREWORD**

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 25 June 1985, after the draft finalized by the Electrical Appliances Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This standard was first published in 1967. The present revision has been undertaken to align this standard with IS : 302-1979\* which is primarily based on the latest IEC Publication. For the sake of convenience of reference, the format of the standard has been modified to bring in line with IEC Publications on household electrical appliances.

**0.3** Solid embedded type heating elements are largely used in hot-plates. Though they also find application in autoclaves, electric irons, etc, however, this specification prescribes requirements and tests mainly for elements for hot-plates.

**0.4** This standard is to be read in conjunction with IS : 302-1979\*. For the sake of convenience, the clauses of this standard correspond to those of IS : 302-1979\*. Instead of reproducing full text of each clause, clauses of IS : 302-1979\* which are applicable ( which means that relevant provisions of the clause apply ) or not applicable and the sub-clauses or portions thereof which are not applicable are indicated as under:

- a) In case of a clause where it is applicable or not applicable, the wording used is 'This clause of IS : 302-1979 is applicable/not applicable'.
- b) In case of a sub-clause or part thereof 'Not applicable'.

---

\*General and safety requirements for household and similar electrical appliances ( *fifth revision* ).

Wherever a sub-clause of IS : 302-1979\* is to be replaced by a new text, it has been indicated as under:

‘Replacement — followed by the new text’.

Any addition to the existing provisions of a sub-clause of IS : 302-1979\* has been indicated as under:

‘Addition — followed by the text of the additional matter’.

Clauses/tables which are additional to those of IS : 302-1979\* are numbered starting from 101 and additional sub-clauses are numbered with the main clause number followed by 101, 102, etc, for example 7.101.

Additional appendices have been numbered starting from AA.

Should however any deviation exist between IS : 302-1979\* and this standard, the provisions of the latter shall apply.

**0.5** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

---

## **1. SCOPE**

This clause of IS : 302-1979\* is applicable except as follows:

**1.1 Replacement** — This standard covers the solid embedded type elements in cast iron or any other suitable metal preformed to receive the heating spiral together with the embedding material and having maximum loading of 5 kW.

**1.4 Replacement** — This standard covers the general, safety constructional and performance requirements and methods of tests and takes into account the influence on safety of components necessary to achieve required degree of radio and television interference suppression.

## **2. TERMINOLOGY**

This clause of IS : 302-1979\* is applicable except as follows:

**2.6 to 2.8, 2.11, 2.17 to 2.19, 2.22, 2.23, 2.25 and 2.26** not applicable.

**2.29 Conditions of Adequate Heat Discharge** — Conditions of operation of the element similar to those specified in relevant individual appliance specification.

---

\*General and safety requirements for household and similar electrical appliances (fifth revision).

†Rules for rounding off numerical values (revised).

**2.30, 2.31, 2.33, 2.34, 2.46, and 2.47** not applicable.

*Additional sub-clauses*

**2.101 Solid Embedded Type Element** — An element in which the heating spiral is insulated from the metal body by embedding material and this material is open to atmosphere.

**2.102 Metal Body** — The metal part of the element which gets heated by the heat given out from the spiral and transmits this heat to the object to be heated. It may be cast or preformed out of sheet metal.

**2.103 Heating Spiral** — The current carrying part of the element having high resistance and which is the source of heat.

**2.104 Embedding Material** — The insulating material which envelopes the heating spiral and retains it in the metal body.

### **3. GENERAL REQUIREMENTS**

This clause of IS : 302-1979\* is applicable except as follows:

**3.1** Para 2 not applicable.

### **4. GENERAL NOTES ON TESTS**

This clause of IS : 302-1979\* is applicable except as follows:

**4.7 to 4.10, 4.13 and 4.14** not applicable.

### **5. RATING**

This clause of IS : 302-1979\* is applicable except as follows:

**5.1 Replacement** — The rated voltage shall not exceed 250 V. The preferred voltage shall be 240 V.

**5.2.2** Not applicable.

### **6. CLASSIFICATION**

This clause of IS : 302-1979\* is applicable except as follows:

**6.1 (a) (2), 6.1 (a) (3), 6.1 (b) (3) and 6.1 (b) (4)** not applicable.

### **7. MARKING**

This clause of IS : 302-1979\* is applicable except as follows:

---

\*General and safety requirements for household and similar electrical appliances (fifth revision).

## **7. Replacement**

- a) Name of the manufacturer, trade-mark or identification mark,
- b) Rated voltage in volts,
- c) Rated input in watts or kilowatts,
- d) Country of origin.

**7.2, 7.3.1, 7.7 and 7.8 not applicable.**

**7.12 Replacement** — An instruction sheet, giving necessary instructions including precautions to be taken for the proper use of heating element shall be provided.

### *Additional sub-clause*

**7.101** The heating element may also be marked with the ISI Certification Mark.

**NOTE** — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks), Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

## **8. PROTECTION AGAINST ELECTRIC SHOCK**

This clause of IS : 302-1979\* is applicable except as follows:

**8.2 to 8.9 not applicable.**

## **9. STARTING OF MOTOR-OPERATED APPLIANCES**

This clause of IS : 302-1979\* is not applicable.

## **10. INPUT AND CURRENT**

This clause of IS : 302-1979\* is applicable except as follows:

**10.2 and 10.3 not applicable.**

## **11. TEMPERATURE-RISE**

This clause of IS : 302-1979\* is not applicable. The test shall be applicable to the appliance where the heating element is used.

### *Additional sub-clause*

---

\*General and safety requirements for household and similar electrical appliances (fifth revision).

**11.101 Minimum Operating Temperature** — The minimum operating temperature in still air and at the rated input at a point midway between the centre and the perimeter of the element shall not be less than 300°C.

## **12. OPERATION UNDER OVER LOAD CONDITIONS OF APPLIANCES WITH HEATING ELEMENT**

This clause of IS : 302-1979\* is applicable except as follows:

### **12.2 Replacement**

The heating element is operated under conditions of adequate heat discharge, the supply voltage being such that the input is

1.33 times the rated input, for heating elements having a rated input not exceeding 100 W.

1.27 times the rated input or 1.21 times the rated input plus 12 W whichever is more for heating elements having a rated input exceeding 100 W.

The heating element is heated till the steady state conditions are established. If a self-resetting thermal cut-out or a non-self-resetting thermal cut-out which is accessible and can be reset without the aid of a tool operates, the operating period is considered to be ended. The heating element is then allowed to cool down and the cut-out is reset for the next cycle.

The heating element is subjected to 15 such heating cycles.

**NOTE** — Forced cooling may be used for the purpose of shortening the cooling period.

### **12.3 Not applicable.**

## **13. ELECTRICAL INSULATION AND LEAKAGE CURRENT AT OPERATING TEMPERATURE**

This clause of IS : 302-1979\* is applicable.

## **14. RADIO AND TELEVISION INTERFERENCE SUPPRESSION**

This clause of IS : 302-1979\* is applicable.

## **15. MOISTURE RESISTANCE**

This clause of IS : 302-1979\* is applicable except as follows:

**15.2.1, 14.2.2, 15.2.3, 15.2.4 and 15.3** not applicable.

---

\*General and safety requirements for household and similar electrical appliances (fifth revision).

**IS : 4158 - 1985**

**16. INSULATION RESISTANCE AND ELECTRIC STRENGTH  
( AFTER HUMIDITY TREATMENT )**

This clause of IS : 302-1979\* is applicable except as follows:

**16.3** not applicable.

**17. OVERLOAD PROTECTION**

This clause of IS : 302-1979\* is not applicable.

**18. ENDURANCE**

This clause of IS : 302-1979\* is applicable except as follows:

**18.1 Paras 3 and 4 Replacement**

The heating element shall be operated in air at 1.1 times rated input for 1 000 operating hours on cycles consisting of half-hour switching on followed by half-hour switching off. After every 100 hours water between 15°C and 40°C shall be poured on the element after the element has been switched off.

**18.2 to 18.4** not applicable.

**19. ABNORMAL OPERATION**

This clause of IS : 302-1979\* is applicable except as follows:

**19.1** Para 2 (b) and (d), 5 and 6 not applicable.

**19.2 Addition**

Conditions without adequate heat discharge are obtained by testing the heating element on the floor of the test corner with the major axis approximately horizontal, in dry condition without applying any artificial means of cooling.

**19.5 to 19.10** not applicable.

**20. STABILITY AND MECHANICAL HAZARDS**

This clause of IS : 302-1979\* is applicable except as follows:

**20.1 Replacement**

Heating elements and their accessories shall have no sharp edge, burns or the like which might cause injury to the user, other than those necessary for the function of the heating element.

**20.2** Not applicable.

---

\*General and safety requirements for household and similar electrical appliances  
( fifth revision ).



## 21. MECHANICAL STRENGTH

This clause of IS : 302-1979\* is applicable except as follows:

**21.4** not applicable.

*Additional sub-clause*

**21.101** The heating element shall be allowed to fall from a height of 1 metre on to a rigidly supported base of hardwood 50 mm thick. The element shall be subjected to five falls from such a position that its major axis is approximately horizontal, and such that each impact occurs on a different part of the heating element. It shall then be subjected to five falls from such a position that its major axis is approximately vertical, with the heating element downwards. After the test, the appliance shall show no damage within the meaning of this specification, in particular live parts shall not have become accessible.

## 22. CONSTRUCTION

This clause of IS : 302-1979\* is applicable except as follows:

**22.4, 22.12, 22.15, 22.18, 22.20, 22.22, 22.24 to 22.27, 22.29 to 22.32** not applicable.

*Additional sub-clause*

**22.101 Metal Body** — It shall be made of a material that does not readily deteriorate during normal use for which it is designed. It may be made by casting or fabricated by welding or formed from sheet metal with the help of press tools.

**22.102 Heating Spiral** — It shall be made out of wire or ribbon of nickel chromium alloy, aluminium-iron alloy or a suitable heat resistant alloy, having a high electrical resistance.

**22.103 Embedding Material** — It shall be electrically insulating, thermally conducting, and fairly non-hygroscopic after the process of embedding is complete.

**22.104 Terminal Connection** — The leads of the heating spiral may be terminated at a terminal block suitable for electrical connections on the elements or may be brought out as flexible leads at least 15 cm long for direct connection on other terminals of the appliance on which the element is intended to be used.

---

\*General and safety requirements for household and similar electrical appliances (fifth revision).

**IS : 4158 - 1985**

### **23. INTERNAL WIRING**

This clause of IS : 302-1979\* is applicable except as follows:

**23.1, 23.4 to 23.8** not applicable.

### **24. COMPONENTS**

This clause of IS : 302-1979\* is applicable except as follows:

#### **24.2 Replacement**

Appliances shall not be fitted with:

- a) switches in flexible cables or cords;
- b) devices which, in the event of a fault in the appliance cause the interruption of the supply by applying a short circuit;
- c) thermal cut-outs that can be reset by a soldering operation; and
- d) self-resetting thermal cut-outs.

**24.3 to 24.10** not applicable.

### **25. SUPPLY CONNECTIONS AND EXTERNAL FLEXIBLE CABLES AND CORDS**

This clause of IS : 302-1979\* is applicable except as follows:

#### **25.1 Replacement**

Heating element shall be provided with a means of connection to supply, in the form of a set of terminals or supply leads.

### **26. TERMINALS FOR EXTERNAL CONDUCTORS**

This clause of IS : 302-1979\* is applicable.

### **27. PROVISION FOR EARTHING**

This clause of IS : 302-1979\* is applicable except as follows:

**27.3** not applicable.

### **28. SCREWS AND CONNECTIONS**

This clause of IS : 302-1979\* is not applicable.

### **29. CREEPAGE DISTANCES AND CLEARANCES**

This clause of IS : 302-1979\* is applicable except as follows:

**29.2 and 29.3** not applicable.

---

\*General and safety requirements for household and similar electrical appliances (fifth revision).

### **30. RESISTANCE TO HEAT FIRE AND TRACKING**

This clause of IS : 302-1979\* is applicable.

### **31. RESISTANCE TO RUSTING**

This clause of IS : 302-1979\* is applicable.

### **32. RADIATION HAZARDS**

This clause of IS : 302-1979\* is applicable.

### **33. FINISH**

This clause of IS : 302-1979\* is applicable.

*Additional Clauses*

## **101. TEST FOR METAL BODY**

The body of the element shall not crack when the following test is carried out:

The element shall be heated for four hours at 1.1 times input wattage ( protective device; if any, may be left in circuit ). A ring 40 mm high and covering half the surface area of the element shall be placed concentrically on the hot plate. A tripod shall be placed over the element and a funnel with an opening of 5 mm at the pouring spout shall be placed over the tripod so that the 5 mm opening is 20 mm above the surface on the element and the spout is at the centre of ring. Water shall be poured in the funnel suddenly till the ring gets full. Water which leaks out from the bottom of the ring will crack the body if the body is of defective material or has constructional defect. This procedure shall be carried out three times and if the body does not crack it shall be deemed to have passed the test.

## **102. EFFICIENCY TEST**

The element shall be placed on 2.5 cm thick asbestos sheet. A pan shall be positioned centrally over the heating surface and it shall have sufficient area to cover the heating surface. The dimensions of the pan shall not exceed the dimensions of the heating surface by more than 10 mm. The pan shall be of normal, not brightly polished aluminium, the bottom surface being flat to within 0.05 mm.

The capacity of the pan shall be 3.0 litres per kilowatt rating and shall contain 1.5 litres per kilowatt rating of initially cold water, evaporation losses being made up as necessary.

---

\*General and safety requirements for household and similar electrical appliances ( fifth revision ).

The thermal efficiency when measured in accordance with Appendix AA shall not be less than 75 percent.

### **103. TESTS**

**103.0 Categories of Tests** — Tests are classified as type, acceptance and routine tests.

**103.1 Type Tests** — The tests specified in Table 101 shall constitute the type tests and shall be carried out on two samples of heating elements of the same type and rating selected preferably at random from a regular production lot. Before commencement of the tests, the heating elements shall be visually examined and inspected for obvious visual defects in respect of components, parts and their assembly, construction, mechanical hazards, markings, provision of suitable terminals for supply connections, earthing and the effectiveness of screws and connections. The external surface finish shall be even and free from finishing defects.

**103.1.1 Criteria of Acceptance** — Both samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If any of the samples fails in any of the type tests, the testing authority, at its discretion, may call for fresh samples not exceeding twice the original number and subject them again to all test(s) or to the test(s) in which failure(s) had occurred. No failure should be permitted in the repeat test(s).

**103 Acceptance Tests** — The following shall constitute the acceptance tests:

<i>Test</i>	<i>Clause Reference</i>
a) Protection against electric shock	8
b) Input	10
c) Temperature rise	11
d) Electrical insulation and leakage current at operating temperature	13
e) Moisture resistance	15
f) Insulation resistance and electric strength ( after humidity treatment )	16
g) Earthing connection	27
h) Test for metal body	101

**NOTE** — For the purpose of acceptance tests, the humidity treatment shall be done for 24 hours while conducting the test for moisture resistance ( 15 ).

**103.2.1** A recommended sampling procedure for acceptance tests is given in Appendix B of IS : 302-1979\*.

---

**TABLE 101 SCHEDULE FOR TYPE TEST**

( Clause 103.1 )

Sl No.	CLAUSe REFERENCE
i) Protection against electric shock	8
ii) Input	10
iii) Temperature-rise	11
iv) Operation under overload conditions	12
v) Electrical insulation and leakage current at operating temperature	13
vi) Moisture resistance	15
vii) Insulation resistance and electric strength ( after humidity treatment )	16
viii) Endurance	18
ix) Abnormal operation	19
x) Mechanical strength	21
xi) Cord grip and cord guard	25
xii) Earthing connections	27
xiii) Creepage distances and clearances	29
xiv) Resistance to heat, fire and tracking	30
xv) Resistance to rusting	31
xvi) Test for metal body	101
xvii) Efficiency test	102

---

**103.3 Routine Tests** — The following shall constitute the routine tests:

<i>Test</i>	<i>Clause Reference</i>
a) Protection against electric shock	8
b) High voltage	13.3.2 of IS : 302-1979*
c) Earthing connection	27

---

\*General and safety requirements for household and similar electrical appliances ( fifth revision ).

**A P P E N D I X A**  
**TABLES OF TYPE TESTS**

This appendix of IS : 302-1979\* is not applicable.

**A P P E N D I X B**  
( *Clause 103.2.1* )

**SAMPLING PROCEDURE FOR ACCEPTANCE TESTS**

This appendix of IS : 302-1979\* is applicable.

**A P P E N D I X C**  
**ELECTRONIC CIRCUITS**

This appendix of IS : 302-1979\* is applicable if electronic circuits are used.

**A P P E N D I X D**  
**MEASUREMENT OF TEMPERATURE WITH THERMOMETER**

This appendix of IS : 302-1979\* is applicable.

**A P P E N D I X E**  
**ALTERNATIVE TESTS FOR PROTECTED MOTOR UNITS**

This appendix of IS : 302-1979\* is not applicable.

**A P P E N D I X F**  
**IMPACT TEST APPARATUS**

This appendix of IS : 302-1979\* is applicable.

---

\*General and safety requirements for household and similar electrical appliances  
( *fifth revision* ).

## **A P P E N D I X G**

### **THERMAL CONTROLS AND OVERLOAD RELEASES**

This appendix of IS : 302-1979\* is not applicable.

## **A P P E N D I X H**

### **MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES**

This appendix of IS : 302-1979\* is applicable.

## **A P P E N D I X J**

### **TEST FOR FIRE RESISTING PROPERTIES**

This appendix of IS : 302-1979\* is applicable.

## **A P P E N D I X K**

### **BNF JET TEST FOR DETERMINATION OF THICKNESS OF COPPER AND NICKEL PLATING**

This appendix of IS : 302-1979\* is applicable if copper and nickel plating is used for finishing

## **A P P E N D I X L**

### **APPROXIMATE MEASUREMENT OF THICKNESS OF CHROMIUM ON NICKEL, STEEL AND COPPER**

This appendix of IS : 302-1979\* is applicable if chromium plating is used for finishing.

---

\*General and safety requirements for household and similar electrical appliances  
(*fifth revision*).

## APPENDIX AA

( Clause 102 )

## TEST FOR THERMAL EFFICIENCY

## AA-1. TEST PROCEDURE

**AA-1.1** The test vessel containing 1.5 litres of water per kilowatt rating of the element, shall be placed centrally on the heating element. The initial temperature of the water shall be noted. The element shall be connected to source of supply, the circuit having been adjusted to give rated input.

**AA-1.2** During the heating up period, water shall be continuously stirred and its temperature measured. When the water temperature is nearly 50°C above the initial temperature of the water, its temperature  $T_2^\circ\text{C}$  just prior to the addition of an extra quantity of water as specified in A-1.3 shall be accurately noted.

**AA-1.3** A quantity of water equal to 0.75 litre per kilowatt rating of the element whose actual mass  $M$  in kg and initial average temperature  $T_1^\circ\text{C}$  are accurately known, shall then be poured into the test vessel, and the heating continued, measurement of electrical input energy in kilowatt hours having begun from this instant. The heating and stirring shall be continued till the whole mass of water again reaches the temperature  $T_2^\circ\text{C}$  when the measurement of input energy shall be discontinued. The electrical energy  $E$  consumed during this period in kilowatt hour is noted.

**AA-1.4** The test shall be repeated with the test vessel rotated through 180° relative to its position in the first test.

## AA-2. CALCULATION OF THERMAL EFFICIENCY

**AA-2.1** The thermal efficiency, which is the ratio of heat absorbed by water to the heat equivalent of electrical energy supplied, expressed as a percentage shall be computed as follows:

$$\frac{MS (T_2 - T_1)}{860 \times E} \times 100$$

where

$M$  = mass of water added and water equivalent of test vessel in kg.

$S$  = specific heat of water in cal/deg,

$T_2$  = final temperature of the water,

$T_1$  = initial temperature of the water,

$E$  = electrical energy input, and

860 = heat equivalent to 1 kWh of electrical energy.





## INDIAN STANDARDS INSTITUTION

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 3 31 01 31, 3 31 13 75

Telegrams : Manaksanstha  
( Common to all Offices )

### Regional Offices :

### Telephone

\*Western : Manakalaya, E9 MIDC, Marol, Andheri ( East ), BOMBAY 400093 6 32 92 95

†Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054 36 24 99

Southern : C. I. T. Campus, MADRAS 600113 41 24 42

Northern : B69 Phase VII, Industrial Focal Point, S. A. S. NAGAR 160051 ( Punjab ) 8 73 28

### Branch Offices :

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001 { 2 63 48  
2 63 49

'F' Block, Unity Bldg, Narasimharaja Square, BANGALORE 560002 22 48 05

Gangotri Complex, Bhadbhada Road, T. T. Nagar, BHOPAL 462003 8 27 16

22E Kalpana Area, BHUBANESHWAR 751014 8 36 27

5-8-56C L. N. Gupta Marg, HYDERABAD 500001 22 10 83

R14 Yudhister Marg, C Scheme, JAIPUR 302005 8 98 32

117/418 B Sarvodaya Nagar, KANPUR 208005 4 72 92

Patliputra Industrial Estate, PATNA 800013 6 23 05

Hantex Bldg ( 2nd Floor ), Rly Station Road, TRIVANDRUM 695001 32 27

### Inspection Office ( With Sale Point ) :

Institution of Engineers ( India ) Building, 1332 Shivaaji Nagar, PUNE 410005 8 24 35

\*Sales Office in Bombay is at Novelty Chambers, Grant Road, Bombay 400007 89 65 28

†Sales Office in Calcutta is at 5 Chowringhee Approach, P. O. Princep Street, Calcutta 700072 27 68 00

Printed at Printograph, New Delhi, India